Investigation Report
Removal Site Evaluation - Final

Paden City Site Assessment
Paden City, Wetzel County, West Virginia

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May 31, 2019

TechLaw

EPA Region III
START V - West
Superfund Technical Assessment and Response Team

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Date Prepared:	May 31, 2019
Prepared by:	TechLaw, Inc.

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ATTACHMENTS:

1.0 INTRODUCTION

TechLaw, Inc. (TechLaw) was tasked by the U.S. Environmental Protection Agency (EPA), Region III to conduct a Removal Assessment in Paden City, Wetzel County, West Virginia. This report provides a summary of investigation activities conducted as part of the Paden City Site Assessment. These investigation activities were conducted under EPA Superfund Technical Assessment and Response Team (START) – West contract EP-S3-15-03, Technical Direction Document (TDD) No. T501-18-01-001.

2.0 SITE DESCRIPTION

The Site consists of mixed residential and commercial areas within the City limits of Paden City, WV in the vicinity of the City's four municipal drinking water wells and water treatment plant (WTP) (Refer to **Figures 1 and 2**). Paden City and the investigation area are located in the Paden City Bottom of the Ohio River Valley along the left descending bank of the Ohio River. The investigation area was located outside the 100-year flood zone.

3.0 BACKGROUND

Based on background documents received by EPA, tetrachloroethene (a.k.a., PCE or tetrachloroethylene) was found in Paden City's drinking water (finished water) during water testing in 2010. The highest PCE concentration was reported at 49.6 micrograms per liter (µg/L) in municipal well # 2. Four City drinking water wells were sampled on August 15, 2017. Analytical results in the municipal wells indicated the presence of PCE at the following concentrations: 0.55 µg/L in Well #1 *(Well #1 is no longer in use)*; 15.1 µg/L in Well #2 *(Well #2 is no longer in use)*; 14.8 µg/L in Well #3; and non-detect in Well #4. Samples of raw water and finished/treated water were collected on August 21, 2017. The analytical results for the samples indicated the presence of PCE at concentrations of 7.58 µg/L in the raw water and 4.32 µg/L in the WTP treated/finished water. The Maximum Contaminant Level (MCL) for PCE (tetrachloroethylene) established under the Safe Drinking Water Act (SDWA) is 5 µg/L. A drinking water sample collected from the distribution system on May 21, 2018 had PCE detected at a concentration of 5.53 µg/L, which slightly exceeded the MCL.

The location of a former dry cleaning facility was identified in the area near the City well field. The former Band Box Cleaners operated a dry cleaning facility at 223 North 4th Avenue in Paden City. The facility had an EPA Identifier of WVD981743578 and is listed as a generator/handler of hazardous wastes, including D039 – tetrachloroethylene (PCE). PCE is commonly used in dry cleaning operations. Documents provided by the West Virginia Department of Environmental Protection (WVDEP) indicate that the dry cleaning business was operated at that location from circa 1959 – 1975.

4.0 INVESTIGATION ACTIVITIES

TechLaw conducted the following activities as part of this investigation: conducted site visits for meetings and to reconnoiter the area; prepared a Sampling Quality Assurance/Quality Control

(QA/QC) Work Plan (SQAP); arranged for analytical services; and conducted a multi-media sampling event which included collection of subsurface soil samples, installation of four groundwater monitoring wells, and collection of groundwater samples from EPA-installed monitoring wells, municipal drinking water supply wells, and a well at a local industrial facility.

The following paragraphs summarize the investigation and sampling activities conducted at the Site and provide a synopsis of the analytical results. Site and sample location maps, photographs, data summary tables, and data validation reports are attached at the end of this report.

4.1 Site Meeting and Reconnaissance – September 27, 2018

On September 27, 2018, the EPA OSC and TechLaw mobilized to the Site to meet with Paden City officials and the West Virginia Department of Environmental Protection (WVDEP). Others in attendance included the Mayor, Mr. Clyde Hochstrasser, representatives from Thrasher Engineering, consultants for Paden City, and Mr. Lew Baker, representing the West Virginia Rural Water Association.

The City Water Plant Operator informed the group that city Well #2 had been shut down due to PCE contamination and Well #4 was shut down for repairs. Well # 3 and #5 were the wells currently in use (Well #1 had previously been put out of service and was replaced by Well #5). The Water plant Operator led the group on a tour of the city water plant, the city wells, and the location of a former dry cleaner. The former dry cleaner had operated as the Band Box Cleaners, EPA Handler identifier (ID) WVD981743578, located at 223 N 4th Avenue, Paden City, WV.

Following the tour, the group met at the City Hall building to discuss the project. EPA planned to prepare a work plan for the investigation, which would include the area surrounding the former dry cleaner property, groundwater, and sampling of the sanitary sewer. The water plant operator indicated that the sanitary sewer line in the street on the north side of the dry cleaner (Wildcat Drive) normally drained to the east to Maurice Street, then to the north and eventually to the city waste water treatment plant. The sanitary sewer line drains from the area of the former dry cleaner toward the location of City Well #2, the first well that was impacted by PCE contamination. Based on existing analytical data results, there was a concern that PCE contamination may have migrated toward Well #2 via the sewer and may have leaked from the terracotta sewer line. The City planned to run a camera through the sewer line to attempt to identify any potential leaks. Plans were also made to install transducers in the city wells to measure groundwater levels.

(b) (9) [redacted]

4.2 Pre-Mobilization Activities

TechLaw prepared a Draft SQAP to outline sampling procedures for collecting subsurface soil samples, groundwater samples from monitoring walls and city municipal wells, and sanitary

sewer samples (TechLaw, 2018). The SQAP also provided for installation of groundwater monitoring wells, specified analytical parameters, and detailed project quality assurance protocols. TechLaw prepared a draft Analytical Request Form (ARF) and submitted it along with the SQAP to the EPA OSC for review and approval. After the OSC approved the SQAP and ARF, TechLaw submitted the documents to the EPA Region III Office of Analytical Services and Quality Assurance (OASQA) - Client Services Team (CST) to arrange for analytical services. The CST scheduled all analytical services through Contract Laboratory Program (CLP) case number 48006. Analytical parameters for soil samples were CLP Target Analyte List (TAL) Volatiles. Parameters for groundwater and sanitary sewer samples were CLP TAL Trace Volatiles. Additionally, analytical services were scheduled for analysis of investigation-derived waste (IDW) soil cuttings and water for waste characterization. IDW samples were analyzed for the following: Toxicity Characteristic Leaching Procedure (TCLP) volatiles, semivolatiles, pesticides, and metals; CLP TAL Aroclors; and total CLP TAL Volatiles (TechLaw, 2018). Samples for TCLP metals were assigned to Chemtex, Port Arthur, TX. All other analyses were CLP organics, and were assigned to Shealey Environmental Services, West Columbia, SC.

TechLaw prepared a request for quote (RFQ) and scope of work (SOW) for drilling services, to include collection of subsurface soil cores using direct-push technology (DPT) and construction/installation of groundwater monitoring wells. The RFQ/SOW was sent to three drilling firms for competitive bid. A subcontract to perform the drilling services was awarded to J.L. Sexton & Son, North Tazewell, VA.

On November 8, 2018, the OSC and TechLaw met with WVDEP and city officials to identify specific locations for installation of groundwater monitoring wells. Locations selected for two wells were located on Paden City High School property. The group met with school officials to explain planned activities and obtained access to the property to install the wells. A background well location was selected in Sturgeon Alley, within the City right-of-way (ROW). The OSC and TechLaw met with the current owner of the former dry cleaner property (former Band Box Cleaner) and explained planned investigation activities. The OSC provided the owner an access agreement form. The owner later signed and granted EPA access to conduct the investigation on the property. TechLaw also delivered an access form to a local manufacturing plant, Wissmach Glass, to get access to collect a groundwater sample from the facility's process water well. The Plant manager later signed and granted EPA access to collect a sample from the facility well.

Prior to commencing the sampling/drilling work, a call was made to WV 811 (MISS Utility) to have underground utilities marked in the investigation area. Additional utility location in city ROWs was provided by the city Water Plant Operator during the course of the investigation.

4.3 Subsurface Soil Sampling and Monitoring Well Installation – November 26 to December 1, 2018

On November 26, 2018, TechLaw mobilized three personnel to the Site to begin a subsurface investigation. From November 26 – December 1, 2018, TechLaw and the subcontracted driller conducted the following investigation activities: collected subsurface soil core samples at 11

locations; logged, screened, and collected soil samples for laboratory analysis from the recovered cores; drilled and constructed four groundwater monitoring wells; and developed the monitoring wells. A detailed description of activities is provided in the following subsections.

4.3.1 Subsurface Soil Sampling

The initial activities involved collecting subsurface soil core samples from the area around the former dry cleaner building and along the sanitary sewer line extending along Wildcat Drive and an alleyway located north and east of the former dry cleaner. Subsurface soil core samples were collected using a track-mounted 54 Series Geoprobe® equipped with a 4-foot (ft.) macro core tube with piston point and dedicated plastic sleeve liners.

Subsurface cores were collected from 11 borehole locations. Eight of the borehole locations were located around the northern and eastern portion of the former dry cleaner building to attempt to find a potential source area of contamination around the building. Three borehole locations were along the sanitary sewer line extending in an east-northeasterly direction along Wildcat Drive and an alleyway to the north and east of the formerly dry cleaner. These boreholes were constructed in an attempt to identify if a historical release of PCE contamination from the sanitary sewer line may have occurred. Borehole/subsurface sampling locations are depicted in **Figure 3 – Subsurface Soil Sample Location map.** Sample identification (ID) numbers, sample depths, PID screening results, a general description of the soil samples, and total borehole depths are presented in **Table 1 – Borehole/Subsurface Soil Sample Descriptions.**

Soil cores were logged for lithology and screened using a photoionization detector (PID) for volatile organic compounds (VOC). The PID measurements were collected every 6 inches in the recovered cores. The logging was used to determine the presence of VOC contamination and groundwater. Logging and screening of the soil cores was used to determine discrete depth intervals with potential contamination for collecting soil samples (PID, visual, odors). Soil samples were collected from intervals of suspected contamination, from the smallest discrete zone exhibiting the highest VOC PID reading. If no contamination was observed, the samples were collected from the capillary fringe zone if groundwater was encountered or near the bottom of the borehole. Soil samples were collected using ESS Core N' One™ samplers, with the exception of SB-06-1, which was collected in 4-ounce glass jars with septa due to an excessive amount of gravel in the matrix. Soil core logs are presented in **Attachment 1 – Soil Core Logs.**

Moist-to-wet conditions in subsurface soil core samples and cold/wet weather conditions limited the effectiveness of the PID screening. No PID readings above zero were observed in many sample intervals which had low-to-moderate concentrations of PCE subsequently reported in laboratory analytical results. However, notable PID reading were observed in soil cores collected from borehole numbers SB-05, SB-06, and SB-07. These boreholes were located on the eastern side of the building, near a garage door in the building. The highest PID reading, 59 parts per million (ppm - calibrated with isobutylene), was observed in SB-05 at approximately 14.5 ft. bgs. This borehole was located immediately north of the gravel area at the garage door. The next highest PID reading was 43.7 ppm in SB06 at a depth of 4-8 ft. bgs (note: the core

sleeve split and the entire core interval was placed into a plastic ziplock bag; the PID reading was made in the headspace of the ziplock). SB-06 was located immediately south of the gravel area by the garage door. Though notable, PID readings were relatively low even for soil samples with high concentrations of PCE as reported in subsequent laboratory results. This is exemplified by soil sample SB-05-1, which had PCE detected at a concentration of 1.9% but had a PID reading of only 59 parts per million.

Boreholes were terminated at 16 ft. below ground surface (bgs) in the eight boreholes around the building (SB-01 through SB-08) due to flowing/heaving sands encountered which prevented core recoveries with the macro core tubes and piston point assembly. Boreholes located along the sanitary sewer line (SB-09, SB-10, and SB-11) were terminated at 12 ft. bgs. Moist-to-wet soils were found from near the surface to the bottom of each borehole around the building and along the sewer line. A wet-to-saturated layer was encountered around 9-10 ft. depth in many of these boreholes, even though no discernible confining soil layers were encountered (silt or clay). Soils around the former dry cleaner building consisted primarily of sand with varying amounts of gravel. Increased moisture levels (wet, saturated) in recovered soil cores were observed primarily in depth intervals where finer sands or silty sands were observed. Static depth-to-water levels measured in boreholes prior to abandonment were (in ft. bgs): SB-01 - 7.55 ft.; SB-02 - 7.55 ft.; SB-03 – 7.85 ft.; SB-04 – 9.45 ft.; SB-05 – 8.55 ft.; SB-06 – 8.95 ft.; SB-07 – 8.35 ft.; SB-08 – 10.35 ft.; SB-09 – no observed water (borehole collapsed to 8 ft. depth); SB-10 – hole collapsed, water observed at approximately 5.5 ft.; SB-11 – no water observed. It is uncertain if the observed groundwater levels are indicative of a perched layer or due to the extremely wet conditions experienced in the area over the previous months. These water-bearing zones were encountered at depths too shallow to be in the alluvial aquifer, though connectivity to the alluvial aquifer is likely. All boreholes were abandoned in accordance with West Virginia State Code – 47CSR60.

The DPT tooling was decontaminated between boreholes. One rinsate sample was collected each day of subsurface soil sampling with the DPT to evaluate the potential for cross contamination. The rinsate samples were collected by pouring deionized ultra-filtered (DIUF) water over the DPT cutting shoe, collecting the rinse water in a dedicated aluminum pan, then filling the sample jars with the rinse water. One trip blank was also prepared using the same DIUF water and shipped in each cooler containing samples to be analyzed for TAL volatiles. The rinsate and trip blanks were analyzed for TAL volatiles.

Subsurface soil samples were stored in coolers on ice until shipment to the assigned laboratory. The samples were shipped to Shealy Environmental Services, West Columbia, SC to be analyzed for CLP TAL volatiles by CLP SOW SOM02.4 under CLP Case No. 48006. Samples were shipped daily due to the 48-hour holding time for volatiles in soil samples. The Regional copies of the Chain of Custody/Traffic Reports (COC/TR) are provided in **Attachment 2 - Chain of Custody/Traffic Reports.**

4.3.2 Monitoring Well Installation

TechLaw directed the subcontracted driller to install four groundwater monitoring wells, designated as EPA01 through EPA04. Well locations were as follows: EPA01 was the background well, located south and presumed hydrologically upgradient of the former dry cleaning property; EPA02 was installed between the former dry cleaner and City Well #2; EPA03 was installed along the edge of Wildcat Drive, adjacent to, and on the north side of the former dry cleaner; and EPA04 was installed between the former dry cleaner and the other city wells (Well #s 3, 4, and 5). (b) (9) [redacted]

The monitoring wells were installed using a truck-mounted B53 drilling rig with 3 ¼" augers, which create an 8-inch diameter borehole. A 2 ft. soil core sample was collected using a split spoon sampler in advance of each 5 ft. auger flight drilled. The soil cores were logged and screened as described in Section 4.3.1; however, soil samples for laboratory analysis were not collected. The primary purpose for logging the soil cores was to determine soil lithology, screen for VOC contaminants, and determine the depth of groundwater in order to determine well construction specifications. The wells were constructed using 2-inch inside diameter schedule 40 polyvinyl chloride (PVC) pre-packed well screens and risers. Well screen size was 0.010 inch (10-slot). All the wells were constructed with flush-mounted surface completions. A general description of the installation of each well is described in the following paragraphs. Well construction specifics such as total depth, screened intervals, and measured depth-to-water after construction are presented in **Table 2 – EPA Monitoring Well Construction/Sampling Depths**. Soil core logs are presented in **Attachment 1 – Soil Core Logs.**

EPA01.

EPA01 was installed in Sturgeon Alley, near the intersection with Work Street. Groundwater was encountered at a relatively shallow depth (saturated soil at 8.5 ft. bgs). This was not assumed to be the alluvial aquifer but possibly a perched/semi-perched zone of groundwater. City officials informed TechLaw that the area had once been a low-lying swampy area that had been filled in many years ago. The well was set with the base at 21 ft. bgs and with a 10-ft. screen interval. The groundwater level was measured at 11.71 ft. from top of casing (TOC) after the well was installed.

EPA02.

EPA02 was installed inside the fence at the Paden City High School football stadium. Groundwater was encountered at approximately 35 ft. bgs. The well was set with the base at 43 ft. bgs and a 10-ft. screen interval. The groundwater level in the well was measured at 34.75 ft. TOC.

EPA03:

EPA03 was installed at the edge of Wildcat Drive, north of the former dry cleaner building. DPT soil cores had been collected near the well location; therefore, split spoon samples were not collected. Static water levels measured in DPT boreholes near the EPA03 location varied between approximately 8 to 10 ft. bgs. The well was set at 21.5 ft. bgs with a 10-ft. screen interval. The measured DTW after the well was installed was lower than expected, at 19.03 ft. TOC.

EPA04:

EPA04 was installed in an alleyway near the intersection of Stephens Street and North 3rd Avenue, adjacent to the northwestern corner of the Paden City High School building. Split spoon core samples collected at approximately 19 ft. and 29-30 ft. bgs exhibited thin layers of saturated soils, with only moist soil below. The well was drilled and set at 59 ft. bgs with a 15 ft. screen interval. The groundwater level in the well was measured at 50.0 ft. TOC after installation.

4.4 Groundwater and Sanitary Sewer Sampling – December 11 – 12, 2018

TechLaw mobilized to the Site and collected groundwater samples and waste water samples from two sanitary sewer manholes on December 11-12, 2018. Groundwater samples were collected from the following locations: the four newly installed EPA monitoring wells; an industrial process water well; Paden City municipal Well Nos. 3, 4, and 5; influent to the City's water plant (with only Well No. 5 operating); and an effluent sample from the water plant. Two waste water samples were also collected from two sanitary sewer manholes located near the former dry cleaning property. The samples were collected in certified-clean 40-milliliter (ml) VOA vials that were pre-preserved with hydrochloric acid (HCL). Groundwater and sanitary sewer samples were stored in coolers on ice until shipment to the assigned laboratory. The samples were shipped to Shealy Environmental Services, West Columbia, SC to be analyzed for CLP Trace TAL volatiles by CLP SOW SOM02.4 under CLP Case No. 48006. The Regional copies of the COC/TR are provided in **Attachment 2 - Chain of Custody/Traffic Reports.**

(b) (9)

(b) (9)

4.4.1 EPA Monitoring Well Sampling

Groundwater samples were collected from EPA01, EPA02, and EPA04 using low-flow sampling protocols as described in the approved SQAP (TechLaw, 2018). An insufficient water column height in EPA03 precluded low-flow sampling. EPA03 was sampled using a dedicated high density polyethylene (HDPE) bailer. The well was bailed dry, and the sample was collected after

allowing time for the well to recharge. Groundwater sampling logs for samples collected using low-flow protocols are provided in **Attachment 3 – Groundwater Sampling Logs.**

4.4.2 Municipal Wells and Industrial Process Well Sampling

Groundwater samples were collected directly from spigots at municipal Well No. 3 (Sample ID GW003) and an industrial process well at the Wissmach Glass facility (Sample ID GW001) after allowing the Well pumps to run long enough to purge the wells. The pump had been removed from municipal Well No. 4 for well maintenance and it was sampled using low-flow protocols (Sample ID GW005). There was no sampling valve/spigot installed on municipal Well No. 5. In order to collect a sample representative of Well No. 5, the City Water Plant Operators shut off the only other operable well (well No. 3) and a sample was collected from the influent sampling faucet inside the Water Plant (Sample ID GW006). A sample could not be collected from municipal Well No. 2 because it had been shut down and had no electric to power the pump and the pump was still in the well, which prevented sampling using the low-flow bladder pump. A sample and a field duplicate of the Water Plant effluent/finished water were collected directly from the effluent sampling faucet in the Water Plant (Sample IDs GW007 and GW012). The effluent samples were preserved with sodium thiosulfate to dechlorinate the samples, in addition to hydrochloric acid.

4.4.3 Sanitary Sewer Sampling

Waste water samples were collected from two sanitary sewer manholes: one located in Wildcat Drive, to the west of the former dry cleaner (Sample ID WW01); and one in Maurice Street, located east of the former dry cleaner. These samples were collected to attempt to identify if PCE contamination could be entering the sanitary sewer lines from a potential source area via breaks in the line. These samples were collected using dedicated, certified-clean 8-oz. glass jars that were attached to an extension pole using plastic zip ties. The waste water was transferred directly from the 8-oz. jars into the sample 40-ml VOA vials. The manhole in Maurice Street was located downstream of the former dry cleaner, but most of the water flow into the manhole at the time of sampling was from the opposite street/direction. Water flow from the manhole at the time of sampling was toward the direction of the dry cleaner, with some flow to the north in the Maurice Street sewer line.

4.5 Investigation-Derived Waste Sampling

TechLaw collected samples of IDW to characterize the wastes for disposal. IDW generated during the investigation included: drill cuttings from DPT subsurface soil sampling and drilling monitoring well boreholes; drilling equipment decontamination water; and monitoring well development and sampling purge water. The IDW was collected in 55-gallon steel drums and temporarily stored at the City Waste Water Treatment Plant until disposal arrangements could be made.

TechLaw collected two samples of IDW soil. One sample (Sample ID IDW-S-01) was collected from the drum in which the DPT soil cuttings from the subsurface sampling around the former dry cleaner and drill cuttings from installation of EPA03 (installed adjacent to the former dry cleaner property) were placed. This drum was the only soil drum expected to have potentially significant levels of contamination. The second sample (Sample ID IDW-S-02) was collected from a drum containing drill cuttings from the installation of EPA02, which was considered to be representative of the remaining drums of well drill cuttings. The sample was collected using an auger to collect a sample from the top to near the bottom of the drum. The soil was placed into an aluminum pan and thoroughly homogenized prior to filling the sample jars, with the exception of the samples for total VOCs and TCLP VOCs. The total VOC samples were collected from the auger directly into ESS Core N' One™ samplers and the TCLP VOC sample was collected directly from the auger and placed into 4-oz. glass jars with septa lids with no homogenization.

TechLaw collected one sample of IDW water from the drum containing purge water from developing and sampling the monitoring wells (Sample ID IDW-W-01). The sample was collected using a coliwasa and by stirring the drum contents and filling the sample jars directly from the drum.

IDW samples were submitted to the assigned laboratories to be analyzed for the following: TCLP volatiles, semivolatiles, pesticides, and metals; CLP TAL Aroclors; and total CLP TAL Volatiles. Samples for TCLP metals were assigned to Chemtex, Port Arthur, TX. All other analyses were CLP organics, and were assigned to Shealey Environmental Services, West Columbia, SC.

5.0 ANALYTICAL RESULTS

5.1 Data Validation

Independent third party data validation of the analytical data provided through the CLP was accomplished by the EPA Environmental Services Assistance Team (ESAT). Data were validated according to the National Functional Guidelines for Organic Superfund Methods Data Review and applicable USEPA Region 3 modifications. Electronic validation was performed by the Electronic Data eXchange & Evaluation System (EXES). The validation report has been assigned the Superfund Data Validation Label S4VEM (Stage_4_Validation_Electronic_Manual). Analytical data for IDW samples did not require validation.

The data validators sometimes assign qualifiers to data based on a review of the data and quality control parameters. Lists of potential data qualifiers and definitions are provided below.

Glossary of Organic Data Qualifier Codes:

Validation Qualifiers	In order of descending precedence. Only one of these qualifiers may apply to any result.

R The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

UJ The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

U The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+ The result is an estimated quantity, but the result may be biased high.

J- The result is an estimated quantity, but the result may be biased low.

Validation Qualifiers	In order of descending precedence. Only one of these qualifiers may apply to any result.

N The analyte has been "tentatively identified" or "presumptively" as present.

B The result is presumed a blank contaminant. This qualifier is used for drinking water samples only.

C The target Pesticide or Aroclor analyte identification has been confirmed by Gas Chromatography/Mass Spectrometry (GC/MS). This qualifier may be added to other qualifiers.

X The target Pesticide or Aroclor analyte identification was not confirmed when GC/MS analysis was performed. This qualifier may be added to other qualifiers.

5.1.1 Data Validation Issues

There were no significant issues with analysis of soil samples identified in the data validation report, though some samples required analysis at a dilution due to high PCE concentrations. This resulted in elevated quantitation levels in some samples.

A significant issue was identified with the analysis of the groundwater and sanitary sewer samples. During sample analyses on 12/22/2018, a foaming sample caused the analytical instrument to stop. The Closing Calibration Verification standard was not analyzed due to the

instrument stop and thirteen samples were re-analyzed 1 to 3 days outside the 14 day technical holding time. Secondary dilutions required for two samples were also analyzed 3 days outside the 14 day technical holding time and the initial analyses of two samples were 2 to 3 days outside the technical holding time. Detected concentrations reported in the affected samples may be estimated low and were qualified "J-". Quantitation limits were assessed as unusable and were qualified "R".

5.2 Analytical Results

Analytical results for subsurface soil, groundwater, sanitary sewer waste water, and IDW samples are discussed in the following subsections. For reference purposes, the analytical results for soil samples were compared with the *EPA Regional Screening Levels* for Resident Soil and Industrial Soil (EPA, 2018). However, it should be noted that the soil samples were collected from depths below 2 ft. bgs, and the contaminants would not be likely be readily available to the ingestion or physical contact routes of exposure to nearby residents and the public. Therefore comparison of the subsurface soil results to the RSLs may not be directly applicable. Groundwater sample results were compared to the Safe Drinking Water Act Maximum Contaminant Levels (MCL) and also the *EPA Regional Screening Levels* for tap water (EPA, 2018). Consistent with EPA Region 3 screening procedures, the RSL table considers a 1E-6 cancer risk and target hazard quotient of 0.1 to account for chemicals that may have additive effects.

5.2.1 Analytical Results for Subsurface Soil Samples

PCE, the primary contaminant of concern (COC) for this investigation, was detected in 11 of the 13 subsurface soil samples. PCE concentrations in soil samples ranged from non-detect to 19,000,000 micrograms per kilogram (µg/kg). PCE was not detected in samples SB09-1 and SB11-1. These samples were collected in Wildcat Drive at locations approximately 60 ft. west of the former dry cleaner building (SB09-1) and in an alley approximately 260 ft. east of the dry cleaner. The remaining samples, which all had detections of PCE, were collected around the perimeter of the former dry cleaner building (**Figure 3**). The highest PCE concentrations were detected in samples SB05-1 at 19,000,000 µg/kg (1.9%) and SB06-2 at 180,000 µg/kg. Both of these results exceed the RSL for industrial soils, 39,000 µg/kg. These samples were collected at locations adjacent to a partially graveled area in front of a garage door in the eastern side of the building at depths of approximately 14 ft. bgs for SB05-1 and 13 ft. bgs for SB06-2. PCE concentrations decreased in soil samples collected to the north (12,000 µg/kg in SB03-1) and south (8,500 µg/kg in SB07-1) of SB05-1 and SB06-2, indicating the *approximate* north-south extent of the main soil source plume on the eastern side of the building. Duplicate samples collected on the western side of the building, SB08-1 and SB08-2, had PCE results of 510 µg/kg and 3,800 µg/kg, respectively. This indicates that the main source area in soils is on the northeastern side of the former dry cleaner building. The main source area has not been delineated to the east of the building.

A summary of analytical results for analytes detected in one or more soil samples is presented in **Table 4 – Summary of Analytical Results for VOCs Detected in Subsurface Soil.** Table 4 also identifies sample results exceeding the RSLs for residential and industrial soils. Complete

analytical results for soil samples are included in **Attachment 4 –Data Validation Report – Subsurface Soil.**

5.3 Analytical Results for Groundwater and Sanitary Sewer Samples

PCE was detected in 10 of the 11 groundwater samples collected from municipal wells, EPA monitoring wells, and an industrial process well. PCE concentrations in groundwater samples ranged from non-detect to 4,700 µg/L.

The highest concentrations of PCE were detected in duplicate samples collected from EPA monitoring well EPA03 (Sample IDs GW010 and GW013) at 4,700 J- µg/L and 4,500 J- µg/L. This exceeded both the MCL of 5 µg/L and the EPA RSL for tap water, 4.1 µg/L. EPA03 is the well located in road adjacent to the former dry cleaner. PCE was also detected in background monitoring well EPA01 (sample ID GW008) at 4.6 J- µg/L. This exceeded the EPA RSL for tap water (4.1 µg/L). EPA01 was located approximately one block hydrologically upgradient (presumably) of the former dry cleaner. It is uncertain if conditions exist in this area with apparent perched zones of groundwater that could periodically result in the groundwater flow direction from the dry cleaner toward the background well. However, the relatively low level of PCE contamination could have resulted from contaminated fill material used to backfill the area many years ago or another potential source of PCE in the area. PCE was not detected in EPA02 (sample ID GW009), which is located between the former dry cleaner and municipal well #2, and was detected at a trace level of 0.19 J µg/L in EPA04 (sample ID GW011), which is located between the dry cleaner and municipal Wells #3, #4, and #5.

PCE was detected in all the municipal wells, with concentration at: 15 µg/L in Well #3 (sample ID GW003); 0.25 J µg/L in Well #4 (sample ID GW005); and 21 J µg/L in Well #5 (sample ID GW006). Note that Well #4 was not in operation and was sampled using low-flow protocol and Well #5 was sampled from the Water Plant influent faucet with only Well #5 operating. PCE was detected in the duplicate Water Plant effluent samples (sample IDs GW007 and GW012) at 7.2 J- µg/L in both samples and also in the sample collected from the Wissmach Glass process water well (sample ID GW001) at 12 µg/L. The PCE concentrations detected exceeded both the MCL (5 µg/L) and the EPA RSL for tap water (4.1 µg/L) in municipal well samples from Well #3 and Well #5, both effluent samples, and in the Wissmach Glass well.

PCE was detected in one of the two sanitary sewer manholes, Manhole #2 (sample ID WW02) at 1.5 J µg/L.

A summary of analytical results for analytes detected in one or more groundwater or waste water samples is presented in **Table 5 – Summary of Analytical Results for VOCs Detected in Groundwater and Sewer Samples.** Table 5 also identifies sample results exceeding MCLs and/or the EPA RSLs for tap water. Complete analytical results for groundwater and sewer samples are included in **Attachment 5 - Data Validation Report – Groundwater and Sewer.**

5.4 IDW Analytical Results and T&D

Analytical results for TCLP VOCs for the IDW soil sample collected from the drummed IDW from the DPT and well installation drilling at the former dry cleaner had a PCE concentration of 2.4 milligrams per liter (mg/L). This exceeded the regulatory limit of 0.7 mg/L. That drum was classified as hazardous waste, waste code D039, which required disposal as a hazardous waste. Results for the other IDW samples indicated the other drums of IDW were non-hazardous. Complete analytical results for IDW samples are included in **Attachment 6 – IDW Analytical Results.**

The eight drums of IDW were transported offsite on March 1, 2019 for disposal at Environmental Enterprises, Inc., 4650 Spring Grove Avenue, Cincinnati, OH 45232, OHD083377010. Copies of the waste manifests are provided in **Attachment 7 – Waste Manifests.**

6.0 CONCLUSIONS AND RECOMMENDATIONS

This investigation has identified a significant source area of PCE contamination in subsurface soil on the eastern side of a former dry cleaner located at 223 N. 4th Avenue, Paden City, WV. PCE was detected in subsurface soil samples up to 19,000,000 µg/kg (1.9%) at a depth of approximately 14.5 ft. bgs. A monitoring well installed in a perched zone of groundwater near the former dry cleaner had PCE detected at a concentration of 4,700 J- µg/L. However, monitoring wells installed between the former dry cleaner and the municipal wells had PCE concentrations detected at only a trace level (0.19 J µg/L in EPA04) or non-detect (EPA02).

PCE levels in municipal wells remains a concern. PCE was detected in municipal Well #3 and Well #5 at concentrations of 15 µg/L and 21 µg/L, respectively. PCE was also detected in an industrial process well located to the east of the municipal Water Plant and Well #4 and #5 at a concentration of 12 µg/L. Samples collected from the effluent/finished water sampling faucet in the Water Plant (not from out in the public distribution system) had 7.2 µg/L PCE.

Recommendations for consideration for further investigation:

- Ground water elevations in monitoring wells and municipal wells should be monitored and the results should be used to do groundwater modelling to evaluate groundwater flow direction in the area. The modelling information would be used to identify locations for installing additional monitoring wells.

- Install additional monitoring wells to help define plume migration from the former dry cleaners. Installation of nested wells to evaluate shallow perched water zones as well as the deeper alluvial aquifer may be warranted.

- Additional subsurface soil sampling should be conducted to better define the contamination plume in subsurface soil near the former dry cleaner. The main source

plume has not been delineated to the east. There is a residence located across the street to the east of the former dry cleaner. An evaluation of the potential for vapor intrusion in the adjacent residence should be considered.

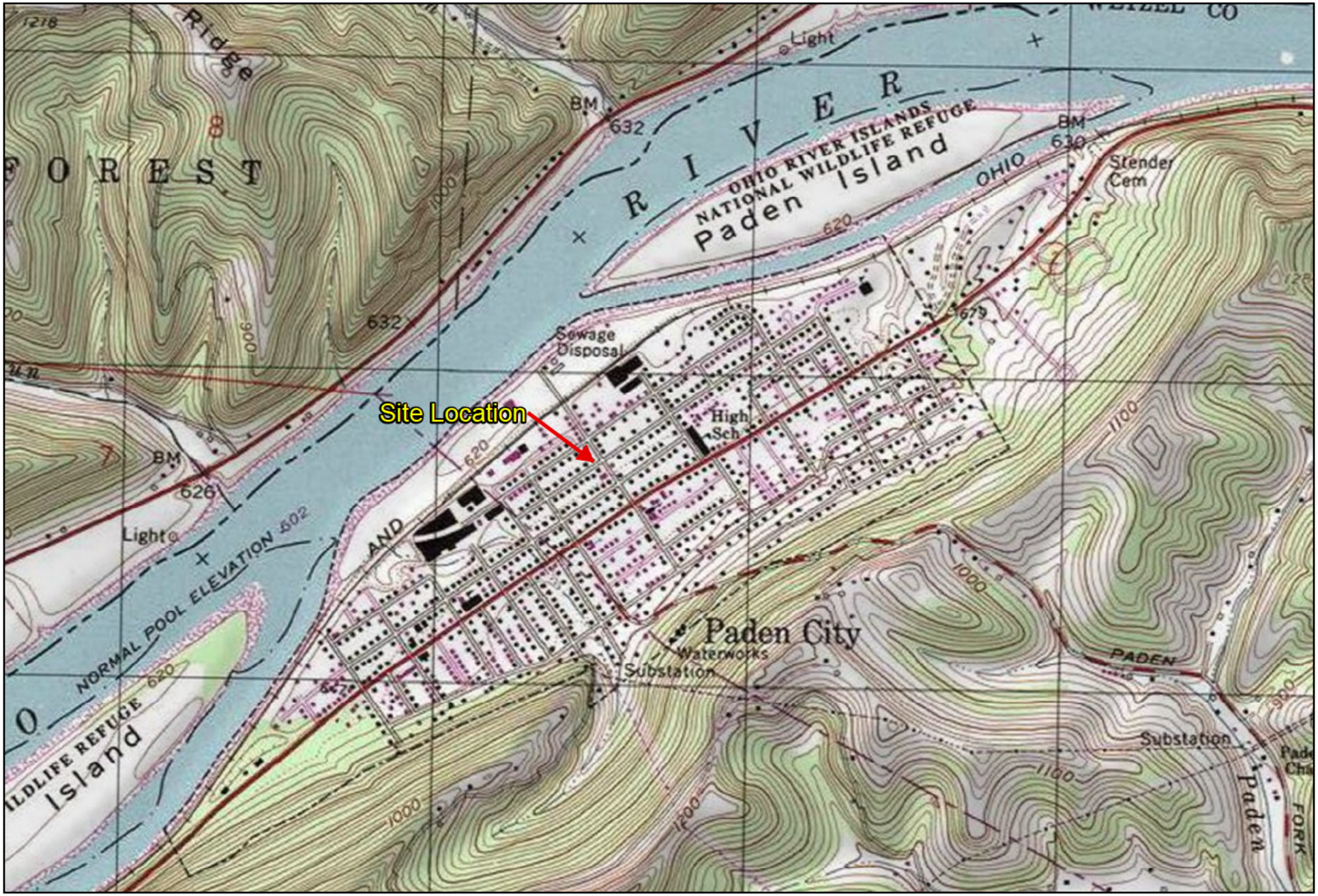
- Additional DPT subsurface investigation should be conducted at the locations of two former dry cleaners (former Rockwell Cleaners and Bud's Cleaner) to verify that potential contamination source areas are not contributing to the contamination in the City municipal wells.

7.0 REFERENCES

EPA, 2018. EPA *Regional Screening Level (RSL) Summary Table (TR+1E-06; HQ=0.1).* November 2018.

TechLaw, 2018. *Sampling QA/QC Work Plan, Multi-Media Sampling - Removal Site Evaluation, Paden City Site Assessment,* prepared by Techlaw, Inc., Wheeling, WV. October 18, 2018.

FIGURES



TechLaw
Contract No. EP-S3-15-03
TDD: T501-18-01-001

Figure 1: Site Location Map
Paden City Site Assessment
Paden City, WV

0 500 1,000 2,000 Feet
NAD 1983 - State Plane West Virginia North (ft)

(b) (9)

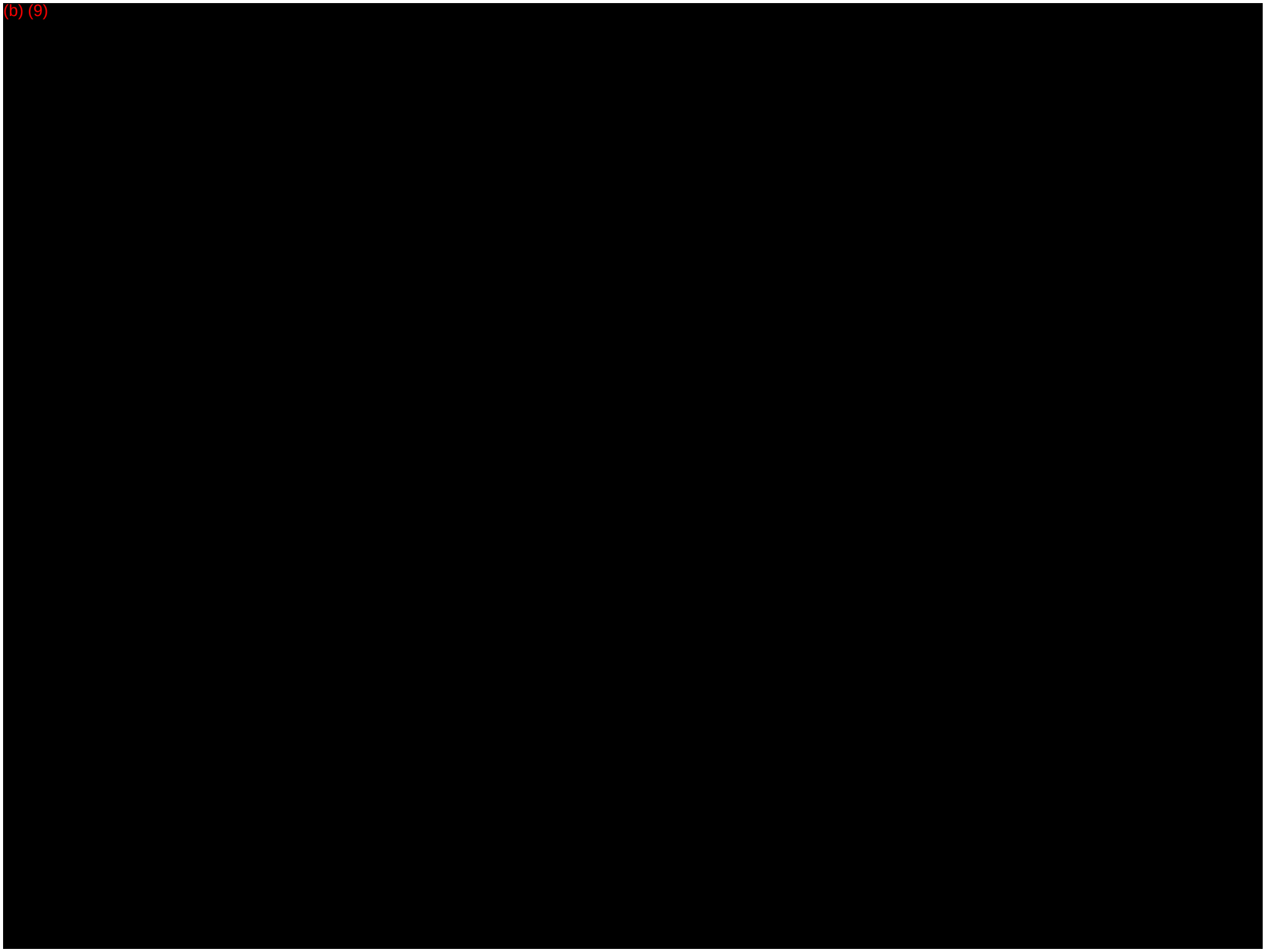
[redacted]

TechLaw
Contract No. EP-S3-15-03
TDD: T501-18-01-001

Figure 3: Subsurface Soil Sample Location Map
Paden City Site Assessment
Paden City, WV

0 15 30 60 Feet
NAD 1983 - State Plane West Virginia North (ft)

(b) (9)



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TABLES

Table 1 - Borehole/Subsurface Soil Sample Descriptions and PCE Results
Paden City Site Assessment
November 26-30, 2018

Borehole No.	Location Description	Total Borehole depth (ft)	Sample ID	CLP Sample No.	PCE Result (ug/kg)	PID (PPM)	Sample Depth (ft)	Comments
SB-01	Northwestern corner of former dry cleaner property.	16'	SB01-1	C0AA0	77	0	9.3-9.5'	Sample collected at top of saturated zone. Soil type - wet, poorly graded sand and gravel, trace to little silt.
SB-02	North/northwestern side of former dry cleaner property.	16'	SB02-1	C0AA1	140	0	14.5-14.7'	Sample collected at top of saturated zone. Soil type - wet, moderately graded sand and gravel, some fines.
SB-03	Near northeastern corner of former dry cleaner property.	16'	SB03-1	C0AA2	12,000	0	13.5-14.2'	Sample collected in saturated zone. Soil type - wet, poorly graded silt and sand, little to no fines. Soil interval appeared more native/natural.
SB-04	North side of former dry cleaner building in corner where smaller and larger sections of the buliding interconnect.	16'	SB04-1	C0AA3	7,200	0	15.3-15.5'	Sample collected near the bottom of the borehole. Soil type - moist, poorly graded medium sand with some silt, little fines.
SB-05	East side of the dry cleaner building. Just north of garage door opening.	16'	SB05-1	C0AA4	19,000,000 (1.9%)	59	14.3-14.6'	Sample collected at depth interval with highest PID reading. Soil type - moist, moderately graded sand and gravel, sand medium-coarse.
SB-06	East side of former dry cleaner building. South side of garage door opening.	16'	SB06-1	C0AA9	2,200	43.7	4.0-8.0'	Core liner was split and soil from core was placed into ziplock bag. Sample collected direct from ziplock bag. Soil type - moist, poorly graded sand and gravel, coarse sand with no fines.
SB-06	East side of former dry cleaner building. South side of garage door opening.	16'	SB06-2	C0AB8	180,000	1.6	13.0-13.3'	Sample collected from depth interval where highest PID readings were observed. Soil type - moist, poorly graded sand and gravel, coarse sand.
SB-07	East side of former dry cleaner building. South of SB-06.	16'	SB07-1	C0AA5	8,500	6.6-8.7	4.0-4.3'	Sample collected from depth with highest PID readings. Soil type - wet, well-graded sand and gravel, little silt.
SB-08	West side of former dry cleaner building near hole in building wall.	16'	SB08-1	C0AA6	510	0	13.5-14.0'	Sample collected from near bottom of borehole. Soil type - moist, poorly graded sand and gravel.
SB-08	West side of former dry cleaner building near hole in building wall.	16'	SB08-2	C0AB9	3,800	0	13.5-14.0'	Duplicate sample of SB08-1.
SB-09	Northwest of former dry cleaner building near sanitary manhole/sewer line in Wildcat Drive.	12'	SB09-1	C0AA7	ND	0	9.6-9.9	Soil type - moist, poorly graded sand and gravel, sand coarse.

Table 1 - Borehole/Subsurface Soil Sample Descriptions and PCE Results
Paden City Site Assessment
November 26-30, 2018

SB-10	Northeast of former dry cleaner building in gravel alleyway along sanitary sewer line.	12'	SB10-1	C0AA8	2,200	0	10.4-10.8'	Sample collected above saturated zone. Soil type - saturated, poorly graded silt with some gravel, some sand.
SB-11	Near eastern end of gravel alleyway along sanitary sewer line. Near intersection with Maurice st.	12'	SB11-1	C0AB0	ND	0	9.2-9.4'	Soil type - moist, moderately graded sand with little gravel, sand medium-coarse.

Table 2 - EPA Monitoring Well Construction/Sampling Depths
Paden City Site Assessment
Paden City, Wetzel Co., WV

Sample Location	Well Depth (ft bgs)	Well Depth (ft TOC)	Screen Interval (ft TOC)	DTW[1] (ft TOC)	Sampling depth (ft TOC)[2]	Sampling Method	Comments
EPA01	21	20.77	10.77-20.77	11.71	18.3	Low-Flow	
EPA02	43	42.58	32.58-42.58	34.75	39.0	Low-Flow	
EPA03	21.5	21.42	11.42-21.42	19.03	19-21.4	bailer	Water column and recharge rate insufficient for low flow
EPA04	59	58.38	43.38-58.38	50	55.0	Low-Flow	
City Well #4[3]	unknown	unknown	unknown	40.85	70.0	Low-Flow	

Notes:

1. DTW measured on 11/30/18, except for city well #4, measured on 12/11/18.
2. Sampling depth is the sampling pump intake depth for the December 11-12 sampling event.
3. Pump was removed from the well and the sample was collected using low flow procedures.

Key:

bgs = below ground surface
ft - feet
N/A = not applicable
TOC = Top of casing

(b) (9)

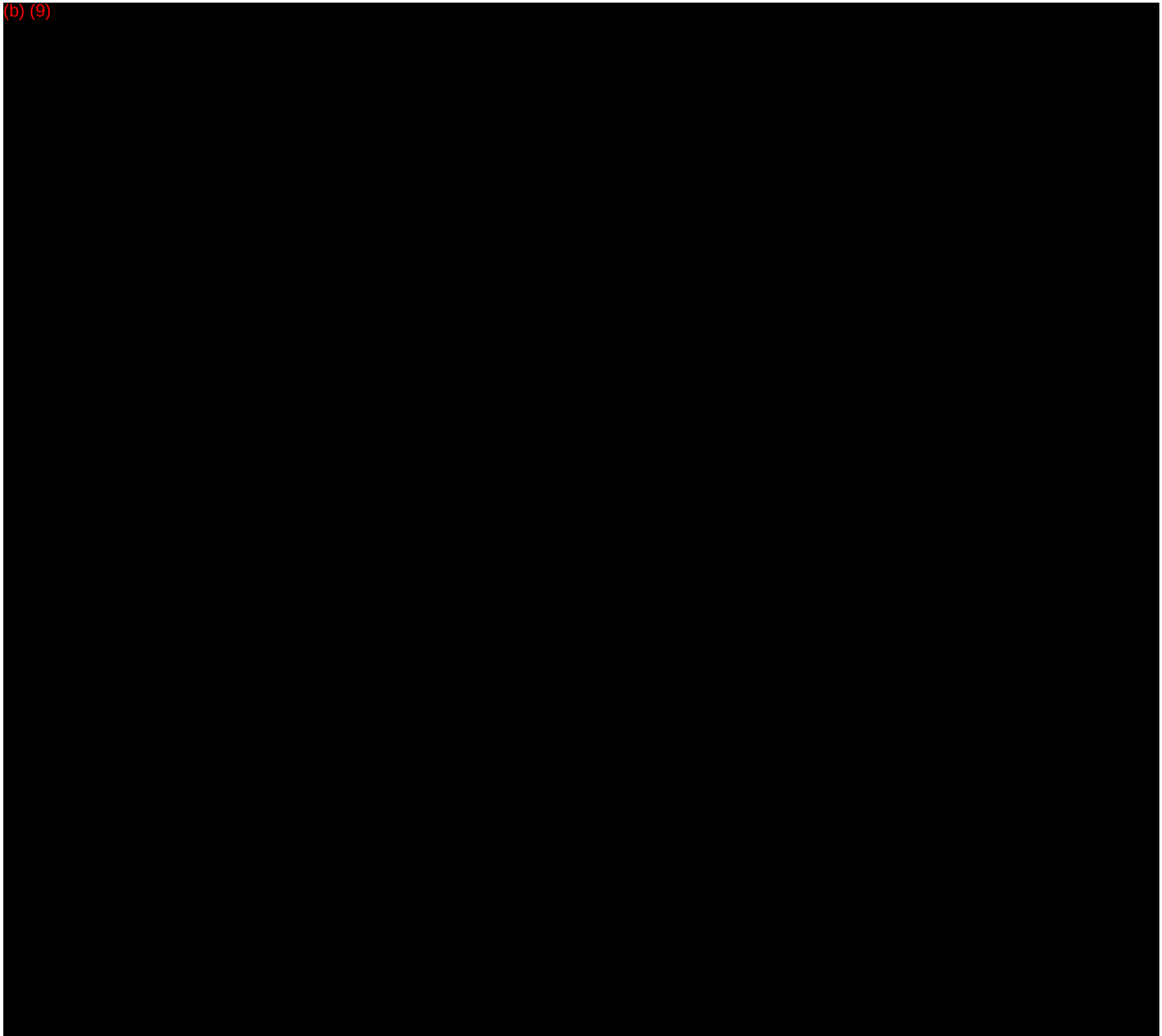

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Table 4 - Summary of Analytical Results for VOCs Detected in Subsurface Soil
Paden City Site Assessment
November 26-27, 2018

			Sample ID:	SB01-1		SB02-1		SB03-1		SB04-1		SB05-1		SB06-1		SB06-2		SB07-1		SB08-1		SB08-2		SB09-1	
			CLP Sample No.	C0AA0		C0AA1		C0AA2		C0AA3		C0AA4		C0AA9		C0AB8		C0AA5		C0AA6		C0AB9		C0AA7	
Shading:			Sample Type:	Field sample		Field sample		Field sample		Field sample		Field sample		Field sample		Field sample		Field sample		Duplicate of SB08-2		Duplicate of SB08-1		Field sample	
Yellow - Result ≥ RSL Res Soil (THQ=0.1)			Sample Date	11/26/2018		11/26/2018		11/26/2018		11/27/2018		11/27/2018		11/27/2018		11/27/2018		11/27/2018		11/27/2018		11/27/2018		11/27/2018	
Brown - Result ≥ RSL Indus Soil (THQ=0.1)			Matrix:	soil		soil		soil		soil		soil		soil		soil		soil		soil		soil		soil	
			Units:	ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg	
Parameter	**RSL_Indus ug/kg**	**RSL_Res ug/kg**		**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
1,1,1-Trichloroethane	3,600,000	810,000		ND		ND		ND		1.2	J	ND		ND		ND		1.7	J	ND		ND		ND	
cis-1,2-Dichloroethene	230,000	16,000		ND		ND		ND		ND		ND		ND		ND		3	J	ND		ND		ND	
Toluene	4,700,000	490,000		ND		ND		ND		0.94	J	ND		ND		ND		ND		ND		ND		ND	
Trichloroethene	1,900	410		ND		ND		ND		3	J	ND		ND		ND		1.7	J	ND		ND		ND	
Tetrachloroethene	39,000	8,100		77		140		12,000		7,200		19,000,000		2,200		180,000		8,500		510		3,800		ND	

Abbreviations:

CLP = Contract Laboratory Program
ID = Identifier
ND = Not detected
Q = Qualifier
RSL_Indus = EPA Regional Screening Level - inustrial soil
RSL_Res = EPA Regional Screening Level -residential soil

Data Validation Qualifiers:

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Table 4 - Summary of Analytical Results for VOCs Detected in Subsurface Soil
Paden City Site Assessment
November 26-27, 2018

		Sample ID:	SB10-1		SB11-1	
		CLP Sample No.	C0AA8		C0AB0	
Shading:		**Sample Type:**	Field sample		Field sample	
Yellow - Result ≥ RSL Res Soil (THQ=0.1)		**Sample Date**	11/27/2018		11/27/2018	
Brown - Result ≥ RSL Indus Soil (THQ=0.1)		**Matrix:**	soil		soil	
		Units:	ug/kg		ug/kg	
Parameter	**RSL_Indus ug/kg**	**RSL_Res ug/kg**	**Result**	**Q**	**Result**	**Q**
1,1,1-Trichloroethane	3,600,000	810,000	ND		ND	
cis-1,2-Dichloroethene	230,000	16,000	ND		ND	
Toluene	4,700,000	490,000	ND		ND	
Trichloroethene	1,900	410	ND		ND	
Tetrachloroethene	39,000	8,100	2,200		ND	

Abbreviations:
CLP = Contract Laboratory Program
ID = Identifier
ND = Not detected
Q = Qualifier

Data Validation Qualifiers:
J = The result is an estimated quantity. The associated nu

Table 5 - Summary of Analytical Results for VOCs Detected in Groundwater and Sewer Samples
Paden City Site Assessment
December 11-12, 2018

		Sample ID:	GW001		GW003		GW005		GW006		GW007		GW008		GW009		GW010		GW011		GW012		GW013	
		Sample Location:	Wissmach Glass		Well #3		Well #4		Influent/ Well #5		Effluent		EPA01		EPA02		EPA03		EPA04		Effluent		EPA03	
Shading:		**CLP Sample No.:**	C0AC2		C0AC4		C0AC6		C0AC7		C0AC8		C0AD0		C0AD1		C0AD2		C0AD3		C0AC9		C0AD4	
Brown - Result ≥ RSL tap water (THQ=0.1)		**Sample Type**	Field sample		Field sample		Field sample		Field sample		Duplicate of GW012		Field sample		Field sample		Duplicate of GW0013		Field sample		Duplicate of GW007		Duplicate of GW0010	
Yellow - Result ≥ MCL		**Sample Date:**	12/11/2018		12/11/2018		12/11/2018		12/11/2018		12/11/2018		12/11/2018		12/12/2018		12/11/2018		12/12/2018		12/11/2018		12/11/2018	
Red - Result ≥ RSL tap water and MCL		**Matrix:**	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
		Units:	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Parameter	**MCL**	**RSL tap water ug/L**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
2-Butanone (MEK)	N/A	560	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Acetone	N/A	1,400	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Carbon disulfide	N/A	81	ND		ND		ND		ND		ND		ND		ND		ND		ND		0.28	J	ND	
Methy tert-butyl ether	N/A	14	ND		ND		ND		ND		ND		0.39	J	ND		ND		ND		ND		ND	
Chloroform	80	0.22	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	1,000	110	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Tetrachloroethene	5	4.1	12		15		0.25	J	21	J	7.2	J-	4.6	J-	ND		4,700	J-	0.19	J	7.2	J-	4,500	J-
Dibromochloromethane	80	0.87	ND		ND		ND		ND		0.47	J	ND		ND		ND		ND		0.45	J	ND	

Abbreviations:

CLP = Contract Laboratory Program
ID = Identifier
ND = Not detected
Q = Qualifier

Data Validation Qualifiers:

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+ = The result is an estimated quantity, but the result may be biased low.

Table 5 - Summary of Analytical Results for VOCs Detected in Groundwater and Sewer Samples
Paden City Site Assessment
December 11-12, 2018

		Sample ID:	WW01		WW02		TB03		FB01		RB03		RB04	
		Sample Location:	sewer manhole #1		sewer manhole #2		QC		QC		QC		QC	
Shading:		CLP Sample No.:	C0AD9		C0AE0		C0AD5		C0AD8		C0AD7		C0AE5	
Brown - Result ≥ RSL tap water (THQ=0.1)		Sample Type	Field sample		Field sample		Trip blank		Field Blank		Rinsate		Rinsate	
Yellow - Result ≥ MCL		Sample Date:	12/11/2018		12/11/2018		12/10/2018		12/12/2018		12/11/2018		12/12/2018	
Red - Result ≥ RSL tap water and MCL		Matrix:	Waste water		Waste water		Water		Water		Water		Water	
		Units:	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Parameter	**MCL**	**RSL tap water ug/L**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
2-Butanone (MEK)	N/A	560	ND		ND		4.7	J	3.0	J	2.7	J	ND	
Acetone	N/A	1,400	ND		ND		4.4	J	ND		ND		ND	
Carbon disulfide	N/A	81	ND		ND		ND		ND		ND		ND	
Methy tert-butyl ether	N/A	14	ND		ND		ND		ND		ND		ND	
Chloroform	80	0.22	ND		ND		1.0	J-	0.85	J-	0.7	J-	0.53	J-
Toluene	1,000	110	3.5	J-	ND		0.22	J	0.1	J	0.091	J	ND	
Tetrachloroethene	5	4.1	ND		1.5	J	ND		ND		ND		ND	
Dibromochloromethane	80	0.87	ND		ND		ND		ND		ND		ND	

Abbreviations:

CLP = Contract Laboratory Program
ID = Identifier
ND = Not detected
Q = Qualifier

Data Validation Qualifiers:

J = The result is an estimated quantity. The associated num
J+ = The result is an estimated quantity, but the result may b